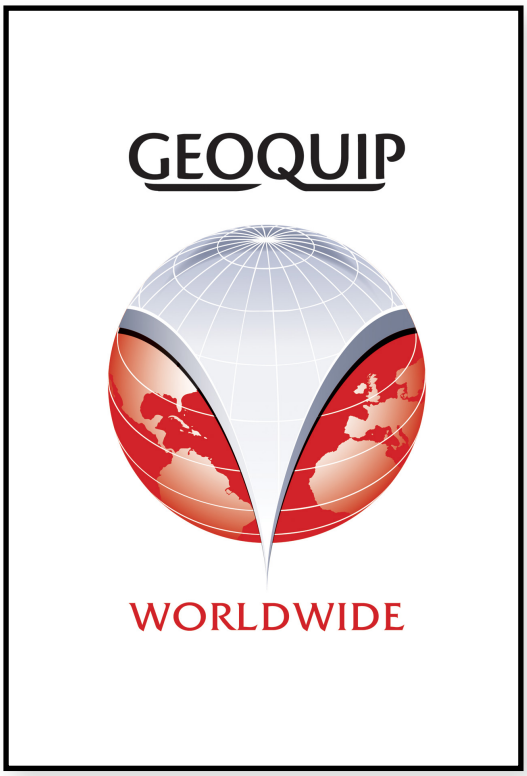


CentrAlert Manual

INSTALLER NOTES

Release Date: 05/09/2006

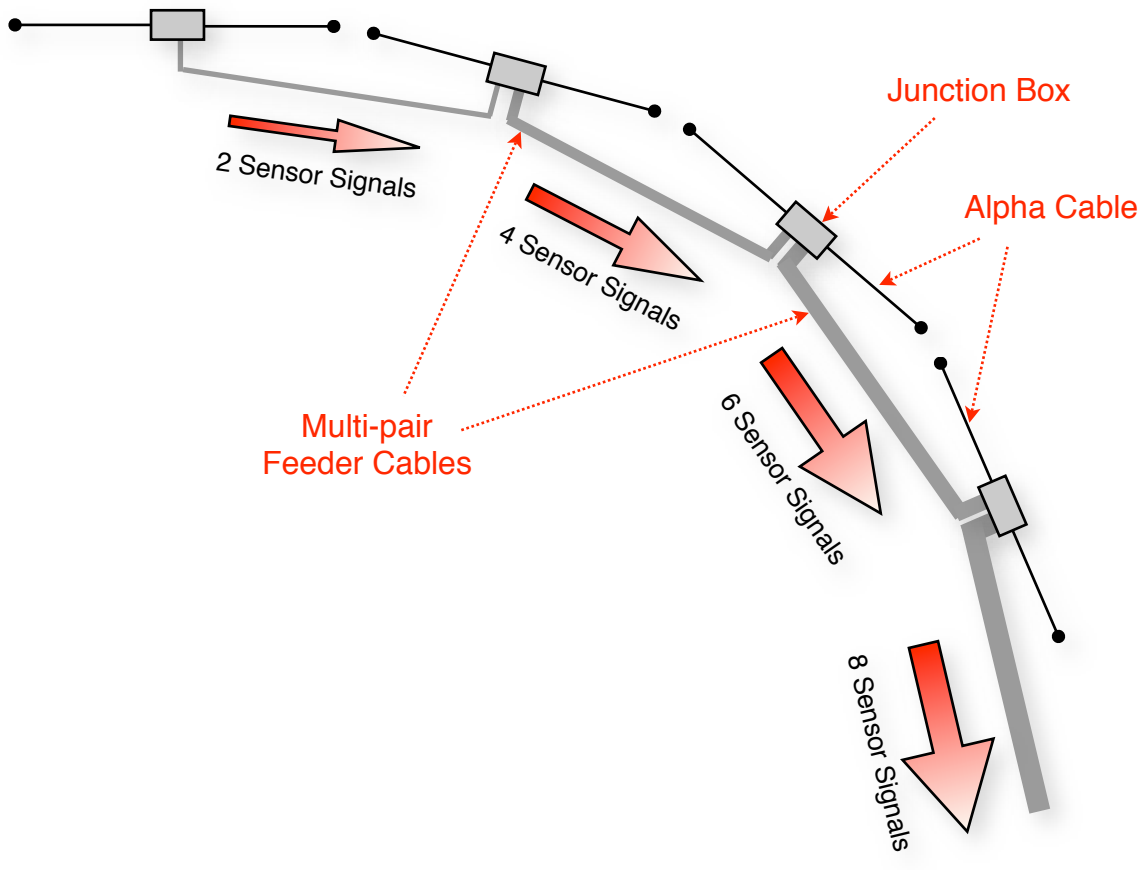
QA0430 Rev 0 05.09.2006

TERMINATING THE SENSOR - Testing Feeder Connections

When multiple feeder-cable connections are made it is important to check each connection as the installation proceeds, as it can be very time-consuming to find one fault among several daisy-chained connections. The recommended procedure is to start the installation at the End Of Line and work back towards the electronics, using a multimeter to test the integrity of the sensor loop after each new junction box and length of feeder is connected. For details see “TESTING THE SENSOR INSTALLATION” below.

TERMINATING THE SENSOR - Multi-Zone Junction Box Connections

In many larger installations multi-pair feeder cables are used to bring the sensor signals from multiple zones back to the electronic equipment sited away from the perimeter. In order to minimise the labour required many sensor signals may be connected using feeder cables of up to as many as twenty pairs running along the perimeter of the site.



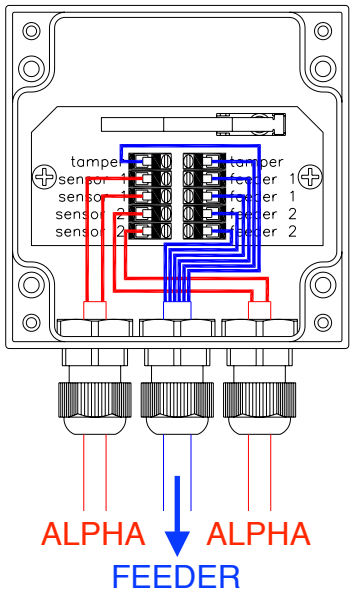
In order to facilitate the inter-connection of these multi-pair cables, Geoquip provide suitable junction boxes in a number of formats.

TERMINATING THE SENSOR - Multi-Zone Junction Box Connections

CONNECTING ZONES IN PAIRS

One of the most common arrangements is for sensor signals to be brought back to the electronics in pairs, with a junction box at the meeting-point of two zones being used to connect the two Alpha cables to a multi-pair feeder cable.

An extra pair within the feeder cable is used to bring the junction box's own Tamper microswitch signal back to the electronics for independent monitoring. The top two terminals connect the microswitch tamper signal into a separate pair within the feeder cable. Thus two zones of Alpha Sensor require three pairs of feeder cable when allowance is made for this extra Junction Box Tamper.

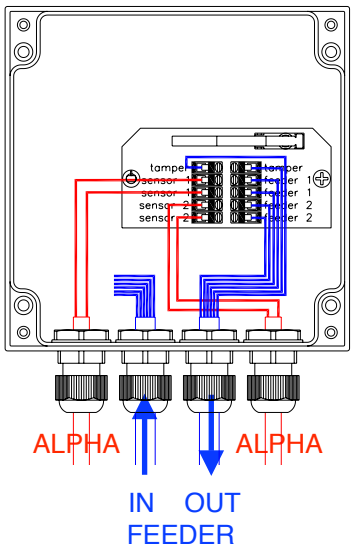


DAISY-CHAINED CONNECTIONS

If a feeder cable with at least five pairs is used, it is then possible to continue the run of feeder to another such meeting-point of two zones and connect the sensors from those zones as well ...

The sensor signals from the two alpha cables are connected into two pairs of the outgoing feeder, and the microswitch tamper signal is linked into a third outgoing pair.

Any pairs of the incoming feeder which are already carrying a sensor or tamper signal are directly connected to a pair of the outgoing feeder while all unused pairs are cut off.



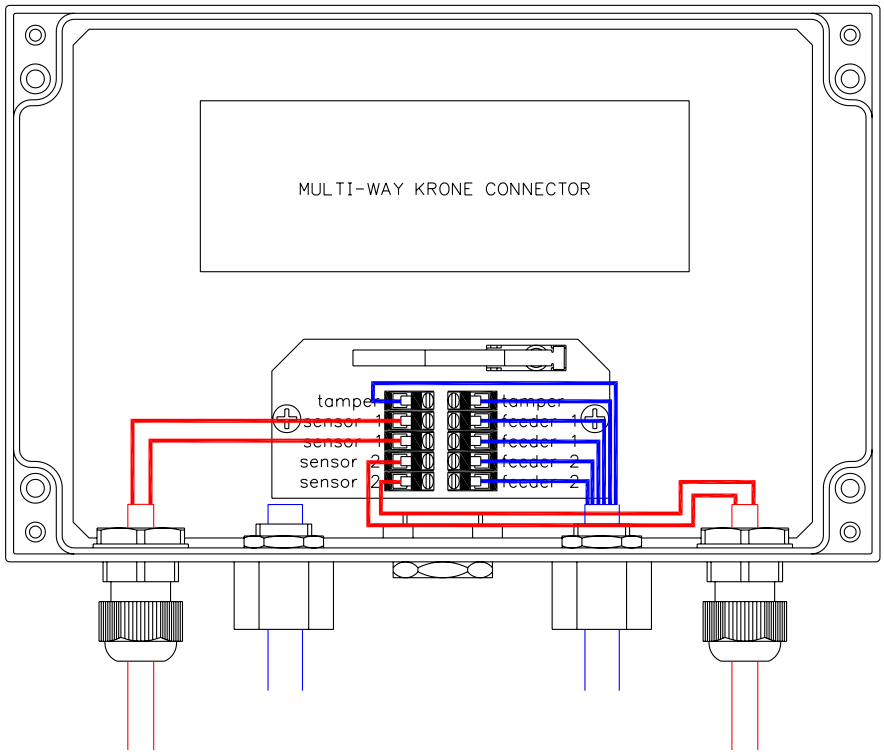
JUNCTION BOX TAMPER SIGNALS

If it is not a site requirement to monitor every junction box lid tamper independently, then the number of pairs used can be reduced. The microswitch tamper signal from this second junction box may be connected in series with the incoming pair which is carrying the lid tamper from the previous junction box, creating one *combined* tamper signal. In the event of sabotage the system would then be able to determine that one of the junction boxes had been opened, but not which one.

TERMINATING THE SENSOR - Multi-Zone Junction Box Connections

CONNECTING LARGE NUMBERS OF ZONES

When feeder cables of up to twenty pairs are used, Geoquip can supply junction boxes with terminal blocks fitted to facilitate the daisy-chaining of the cables ...



An alternative version suitable for the connection of four sensors is also available. This would be used when Dual Zones are implemented and separate Upper and Lower sensor runs are to be connected from each of the two zones at the junction box.

The multi-way Krone Connector Block provides an easy way to connect the incoming feeder pairs carrying existing sensor or tamper signals to the appropriate pairs of the outgoing feeder.

TESTING THE SENSOR INSTALLATION

Once the sensor is attached to the fence and connected to its End-Of-Line termination it is possible to test the integrity of the installation even before the electronics is installed. It is in fact advisable to test each connection in a chain AS IT IS INSTALLED (see “Testing Feeder Connections” above). The following test procedure should be followed ..

The EOL termination used in CentrAlert systems is a 4k7Ω resistor in parallel with a capacitor for signal bypass.

A simple multimeter may be used to test the loop resistance of the sensor after installation. Set the meter to auto-range resistance metering and connect its probes to the appropriate pair of the feeder cable carrying the relevant sensor signal - the reading may briefly be unstable but should settle to around 4k7Ω after a couple of seconds.

If the resistance measured is significantly lower than 4k7Ω then there is a short circuit somewhere in the installed wiring.

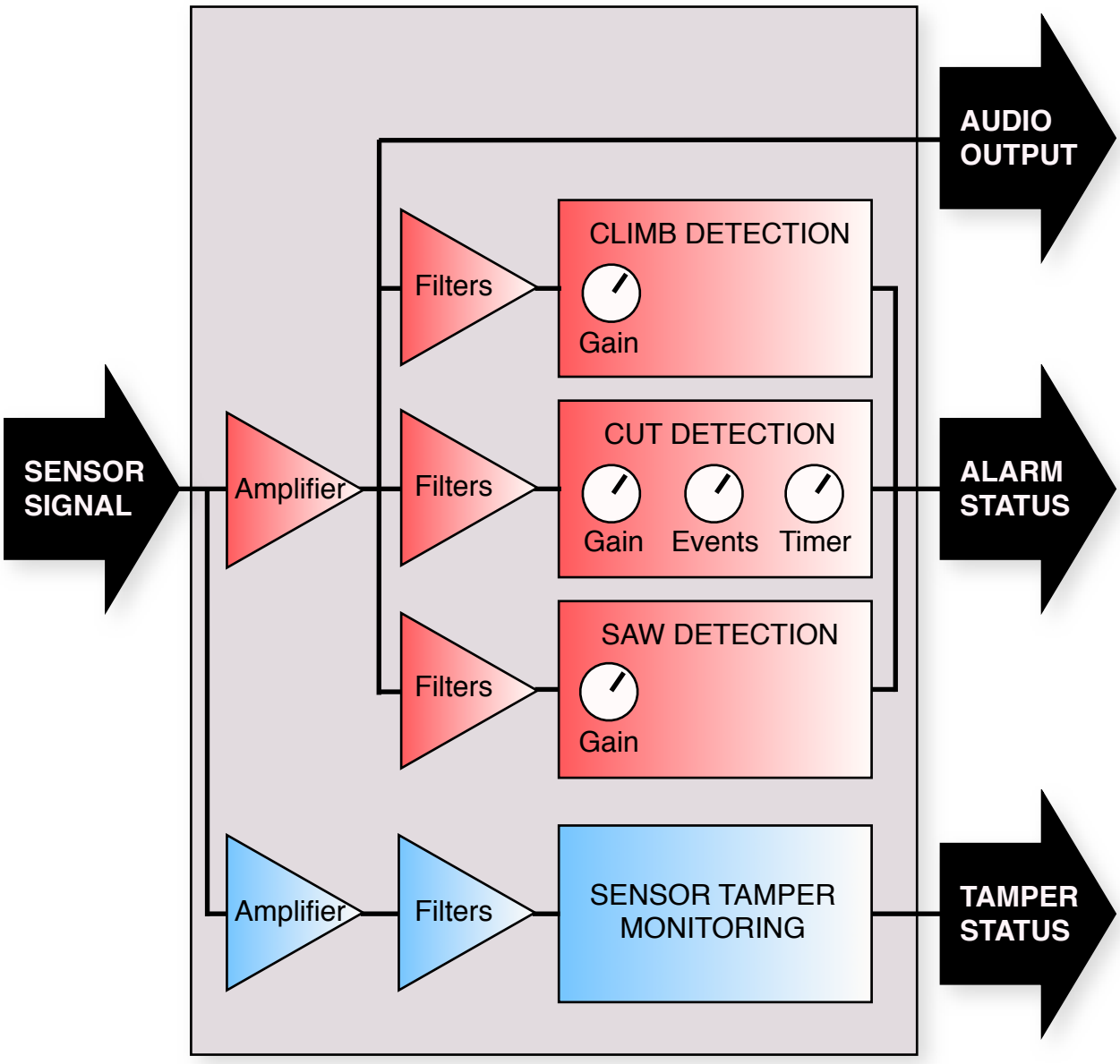
If the resistance measured is significantly higher than 4k7Ω then there is a poor connection or an open circuit somewhere in the installed wiring.

Note that the long runs of feeder cable often used in CentrAlert installations will increase the loop resistance by a few hundred ohms, but this should not significantly affect the readings taken.

ELECTRONIC SIGNAL PROCESSING & ANALYSIS

PRINCIPLES OF OPERATION

The Alpha Microphonic Sensor Cable's signal is amplified, processed and analysed electronically to identify the typical vibration "signatures" of climb, cut and other attacks on the fence. This electronic analysis involves various stages of filtering and other signal processing to distinguish these signatures from other sources of disturbance such as weather. It offers multiple channels of analysis each dedicated to detecting a particular form of attack, with various controls over the performance of these different channels.



The signal processing also includes a section dedicated to monitoring the integrity of the sensor. This will generate a tamper signal if the sensor is disconnected or short-circuited.

ELECTRONIC ANALYSIS EQUIPMENT - The Detection Channels

As can be seen from the graphic above, each of the three channels of detection has a Gain or Sensitivity control to allow the system to be adjusted to suit the fence fabric, site conditions etc., and the Cut channel features two extra controls.

The Climb Channel (often referred to as Channel A) includes sophisticated processing to reject as much environmental disturbance as possible while still detecting the characteristic signature of a climb-over attack The unrivalled performance of Geoquip's analysis equipment allows for reliable operation in heavy rain and with winds of up to 70km/h, though care must be taken to ensure that the fence fabric is in good condition and does not vibrate or rattle in adverse conditions.

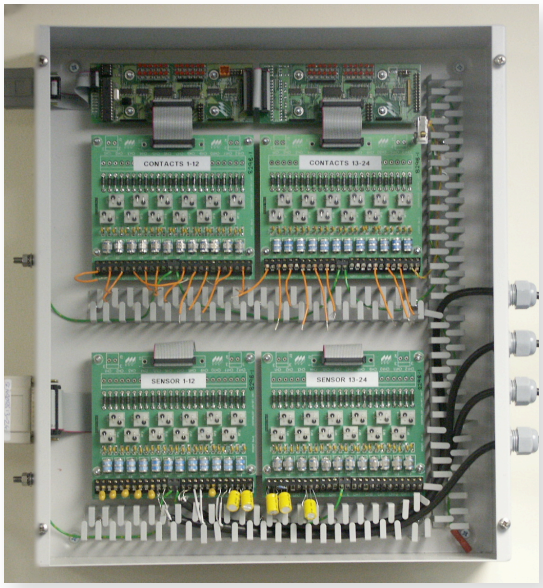
The Cut Channel (also known as Channel B or the Impact Channel) includes additional controls for "Events" and "Timer" which allow the user to determine the number of Cut or Impact events which must occur within a certain time window in order for an Alarm to be generated. A common setting is for two Cut events to be required within a thirty-second window for a full Alarm condition to be registered. This greatly reduces the nuisance alarms caused by one-off accidental impacts or electrical discharges.

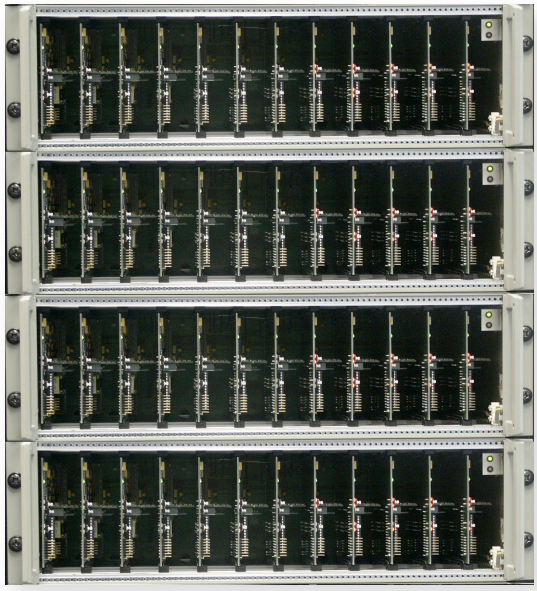
The Saw Channel (often called Channel C) is extremely sensitive and should be used with caution. Attacking the fence with a saw typically generates much less sensor signal than a Cut or Climb attack, and in exposed areas environmental disturbance may well swamp this small signal. But in installations where the fence is well protected from the weather (e.g. prisons) this channel will allow the detection of subtle attempts to create a break in the fence with repeated light saw attacks over a long period.

Specific procedures for adjusting these various channel controls to give optimum protection for any particular site are provided in the installation documentation supplied with the analysis equipment.

ELECTRONIC ANALYSIS EQUIPMENT - CENTRALERT

One CentrAlert unit can process up to 512 sensor and/or contact inputs but must be rack-mounted in a controlled environment between +10 and +50 degrees C.





It requires mains power (approx 50W per 24 zones) and can communicate by relay outputs, RS232, RS485 or Ethernet. Extremely flexible options are available for serial or bus communication with multiple Management Systems as well as Mimic Panels, and a CentrAlert rack system can also provide simple control of many CCTV systems directly without the intervention of any third-party devices. It can also interface to GPS and Rugby timecode devices, and send time information to other devices within the security system.

Full lightning and transient protection is provided as part of the Marshalling Box terminal boards, and the Marshalling Box is electrically isolated from the rest of the rack-based circuitry by a combination of transformers and opto-electronics. This protects the more fragile and costly rack-based hardware from the majority of damage which might otherwise be incurred during installation or during severe electrical disturbance.

CentrAlert has NO onboard controls for adjusting the system's performance, and is intended solely to be configured via RS232, RS485 or Ethernet using an external control system such as Geolog. This makes the CentrAlert format ideal for applications where absolute security is required - the vulnerable electronics are mounted away from the perimeter in a protected environment, and no adjustments whatsoever can be made without authorised access to the control system.

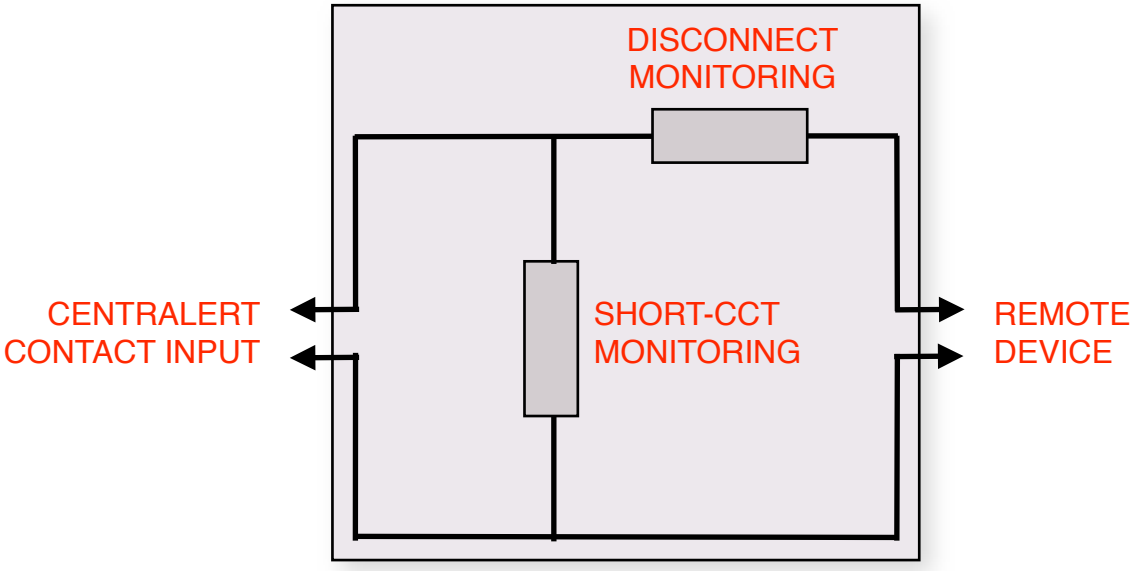
A selectable audio signal to assist with operator alarm verification is available as a balanced 600Ω 0dBA analogue output.

ELECTRONIC ANALYSIS EQUIPMENT - CENTRALERT

MONITORED CONTACT INPUTS

As described above, CentrAlert provides inputs for dry contact connections as well as for Alpha Microphonic Sensors, allowing other perimeter protection devices such as Infra-Red Beams or Microwaves to be connected into the system. Alarm or Tamper signals from these other devices are then communicated along with any Alarms or Tampers generated by the electronic analysis of the Alpha Sensor signals.

These contact inputs are fully monitored so that as well as being able to receive Alarm notifications from an external device, they can also be used with monitoring resistors to detect whether the device has been disconnected or shorted out in which case a Tamper signal will be generated ...



Control options are provided to allow the user to specify the value of monitoring resistors used (if any) on each dry contact input, and also to set the appropriate polarity of contact signal. Most devices signal an Alarm condition by opening a normally-closed relay, but in the event that a device signals an Alarm by CLOSING the relay the corresponding contact input on CentrAlert can be configured accordingly.

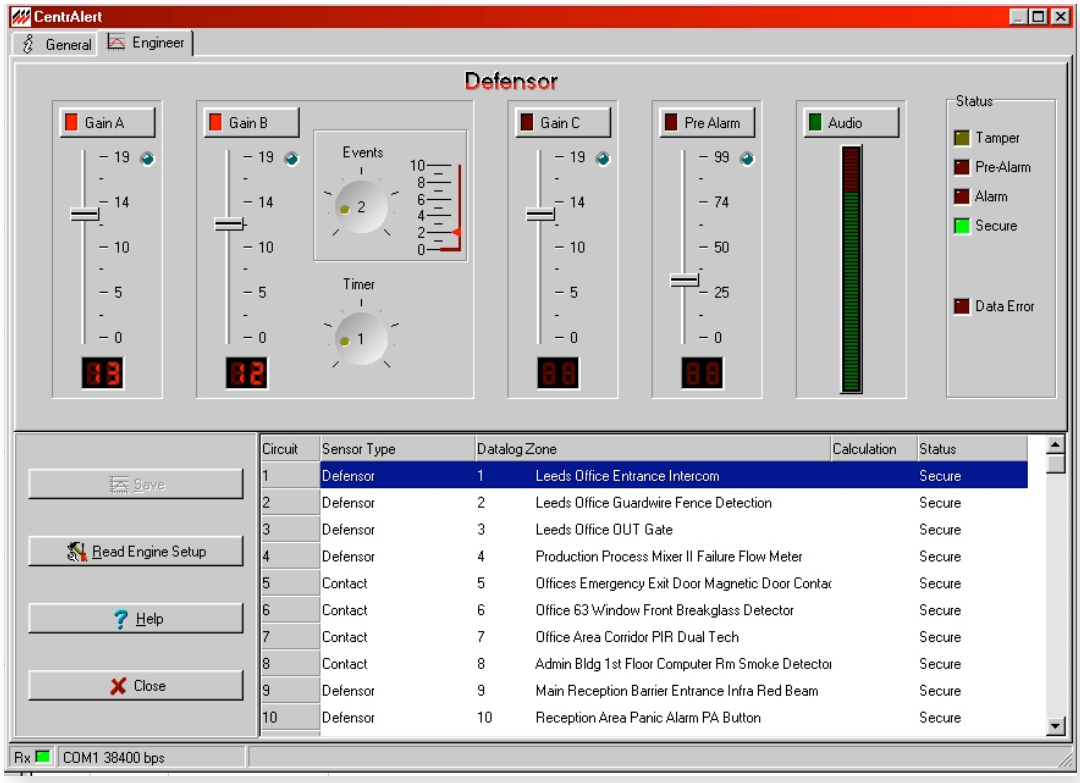
A delay facility is also provided which allows for brief activations of a contact input to be ignored. A minimum time can be set for which a contact must remain active in order to generate a full Alarm condition. This can be helpful with e.g. some laser-based detection systems which can indicate a series of very brief alarms if a minor interruption occurs such as a bird flying through the beam. These nuisance alarms can be reduced if required using this delay feature.

ELECTRONIC ANALYSIS EQUIPMENT - CENTRALERT

REMOTE ADJUSTMENT AND DIAGNOSTICS

As well as offering simple relay outputs for Alarm and Tamper Annunciation, CentrAlert can also communicate by RS232, RS485 or Ethernet. These fully bi-directional interface options allow CentrAlert not only to transmit notifications of Alarm & Tamper conditions, but also to offer full remote adjustment and diagnostics.

These features allow the use of sophisticated computer systems to control the signal analysis parameters, and so a clear & comprehensive user interface may be presented to the engineer graphically on screen ...



... including the display of diagnostic information such as overall sensor signal level and the current detection status of each of the separate channels.

The Remote Adjustment facility also offers a significant advantage in terms of system security. If there are no controls directly accessible on the electronics then only those personnel with authorised access to the controlling computer system will be able to perform any modifications to the detection settings. Thus it would not for example be possible for a rogue operator to reduce the system sensitivities so as to allow undetected access to the site. Equally all changes made to the system's settings through Remote Adjustment are logged on the computer system and may be inspected by senior personnel at any time.

ELECTRONIC ANALYSIS EQUIPMENT - CENTRALERT

DATA CONNECTIONS - RS232 *vs* ETHERNET

As well as being able to signal Alarm events by simple relay outputs, CentrAlert has two main options for intelligent communications - RS232 and Ethernet.

The most important difference between the two is that RS232 is a *point-to-point* connection, so a separate serial port will be required on the management system for each device to be connected. Ethernet is a *bussed* connection, however, allowing multiple devices to be attached via a single Ethernet port on the management system. Thus if a site is going to be protected using many separate CentrAlert units, an Ethernet network represents the most efficient way to connect these multiple units to a single management system.

It should be noted that a point-to-point RS232 connection represents a critical point of failure if broken, whereas a suitable Ethernet network such as Geoquip's own Gthernet system allows for redundant data paths. This means that if a network connection is broken the Gthernet system will "self-repair" using redundant links until such time as the broken connection is restored. A broken RS232 connection, however, results in a complete loss of communication with the device in question until repaired.

AUDIO CONNECTIONS - ANALOGUE *vs* ETHERNET

CentrAlert provides an analogue Audio Output to allow the operator to listen to the signal from the perimeter to assist in Alarm Verification and Monitoring.

If an RS232 data connection to the management system is used, this audio signal is usually transmitted separately on twisted-pair cable and connected to a sound-card input on the management system computer. Thus it may be presented to the operator through the same speakers which play the system warning sounds etc.

If an Ethernet connection is used to link the electronics and the management system, however, the audio is streamed as data through the network and no separate analogue connection is required. This is of particular benefit when more than one CentrAlert is used as it removes the need to provide multiple sound-card inputs for the audio connections.

ELECTRONIC ANALYSIS EQUIPMENT - CENTRALERT

INSTALLATION IN THE PLANT ROOM

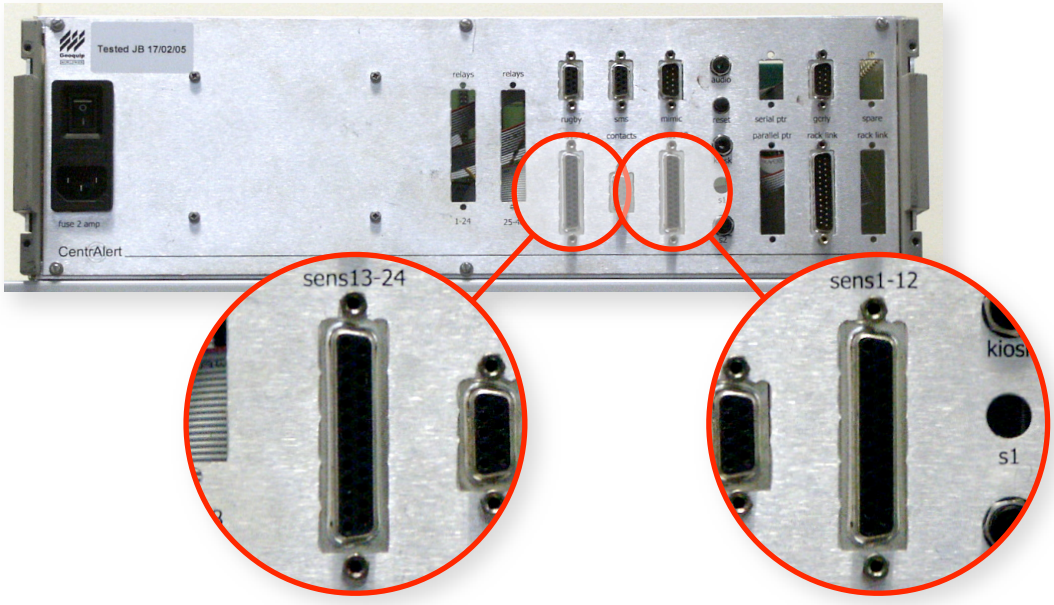
CentrAlert is supplied in 19” rack-mount units with one or more external Marshalling Boxes providing all the required terminals for the connection of input signals from the perimeter. The number of rack-mount units and the number of Marshalling Boxes depends on the scale of the installation - one rack unit is required per 24 sensor signals, and one Marshalling Box can receive up to 72 sensor or contact signals from the perimeter.

The Marshalling Box usually connects to the rack-mounted analysis units using pre-made cables supplied with the equipment, but the layout of the plant or control rooms may be such that it is necessary to fabricate some of these cables on site. If so the installer should contact Geoquip for details of the cable connections.

It is important to note that the connecting cables between the Marshalling Box and the rack units should not exceed 5m. A common arrangement is for the Marshalling Box to be mounted on the wall adjacent to the cabinet housing the rack units, keeping the cable runs short and making access easy for the connection of the signals brought in from the perimeter.

SENSOR CONNECTIONS BETWEEN MARSHALLING BOX AND RACKS

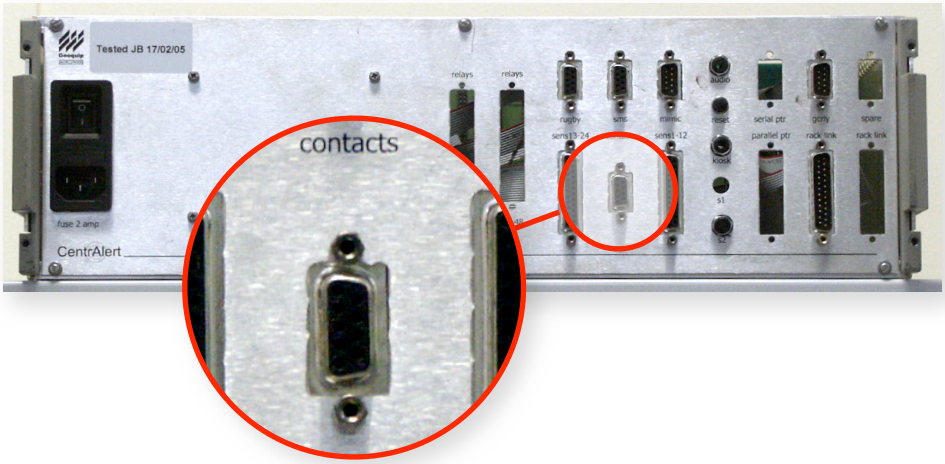
Each group of twelve sensor signals from the Marshalling Box is connected via a 25-way D-type cable to the appropriate rack unit. Since each rack unit can handle up to 24 sensors, there are two connectors on the rear of each rack (Master and Slaves) to receive these 25-way cables ...



Connection for sensors 13-24 Connection for sensors 1-12

CONTACT CONNECTION BETWEEN MARSHALLING BOX AND RACKS

There is one 9-way D-type cable connection to carry all the Contact signals between the Marshalling Box and the Master Rack Unit. The connector for this is found on the rear of the Master Rack ONLY (this connector is not fitted to Slave Racks) ...

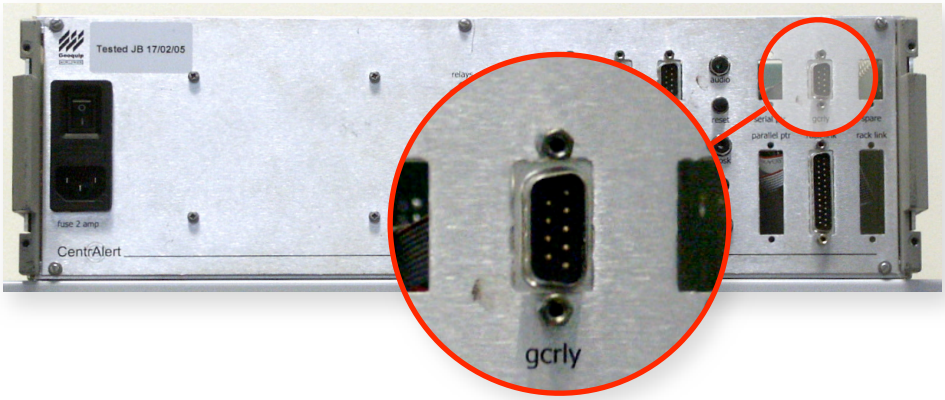


Connection for Contact Signals

A standard “straight-through” 9-pin male-to-female serial cable will achieve the correct connection. Note that this is NOT a standard RS-232 connection. The cable carries power to the circuitry within the Marshalling Box which monitors the contact inputs, as well as optically isolated data signals, and should NEVER be connected or disconnected while the system is powered up. If it is necessary to break this connection, power the system down before doing so.

CONNECTION TO GCRLY RELAY RACK

If a CentrAlert is supplied with relay outputs, for example to drive a mosaic mimic panel or similar, the RS-232 connection for this is found on the rear of the Master Rack Unit ...

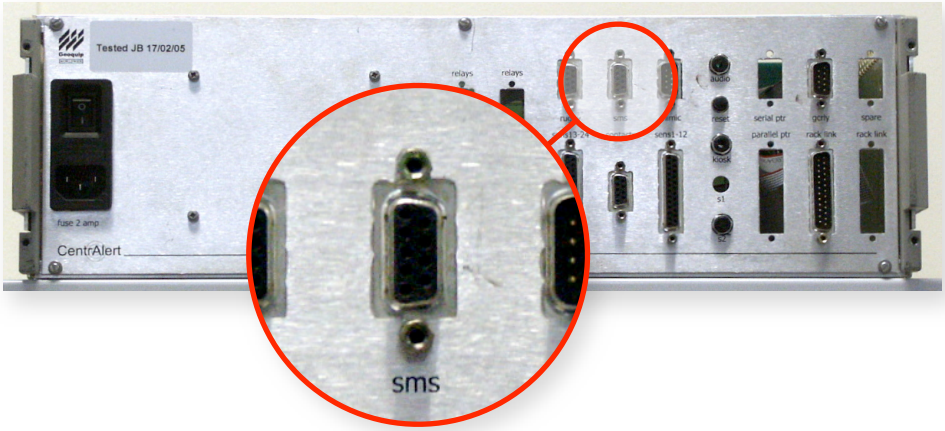


RS232 Connection to GCRLY

A “straight-through” 9-pin female-to-female D-type cable will achieve the correct connection to the connector labelled “CONTROL” on the rear of the GCRLY unit.

CONNECTION TO THE MANAGEMENT SYSTEM - RS232 & Audio

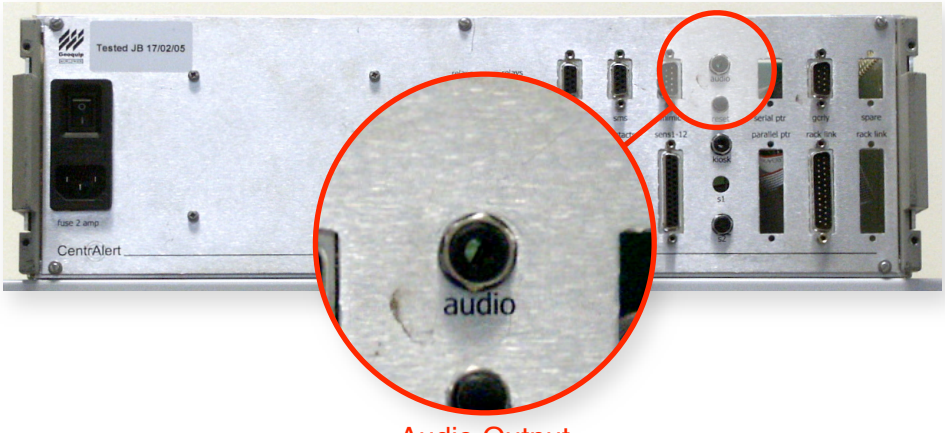
Since the rack units are normally mounted within the control room area of the installation, the most common interface used to make a data connection to the Security Management System is RS232. The 9-pin D-type connector for this is to be found on the rear of the Master Rack Unit, labelled ‘sms’ ...



RS232 Connection to Management System

A normal “straight-through” 9-pin male-to-female serial cable will achieve the correct connection to a computer’s serial port (i.e. NOT a null-modem cable). Note that the maximum distance for a direct RS232 connection is about 25m, and in many cases the layout of plant and control rooms may make it necessary to extend this range using off-the-shelf line drivers or fibre modems. The normal data rate for CentrAlert communications is 9600 baud so most line drivers will enable a connection of up to 1km.

The 0dB 600 ohm balanced analogue Audio Output is provided as a 3.5mm jack connection on the rear of the Master Rack ...

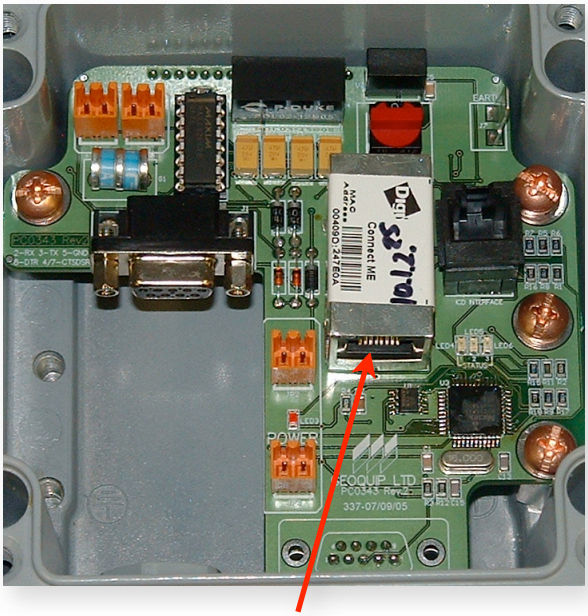


Audio Output

Please note that due to the lack of international standards for 3.5mm jack connections, only the matching jack plugs supplied with the rack units should be used to make the connection from this output to the management system’s sound-card input.

CONNECTION TO THE MANAGEMENT SYSTEM - Ethernet

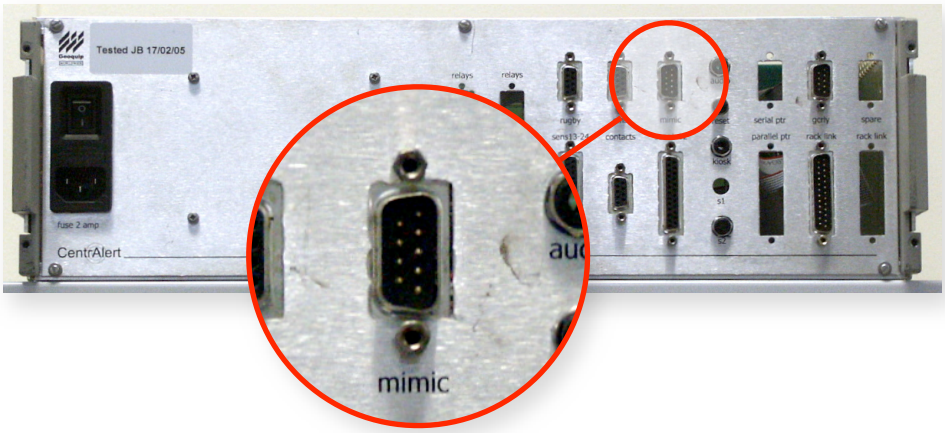
If a CentrAlert is fitted with an Ethernet interface, this will be mounted separately within the rack-mount enclosure ...



A CAT5 cable should be connected between this RJ45 and a suitable network switch, hub or router which links through to the Management System's network port. This is a 10/100Mb Ethernet connection which includes audio as a data-stream when required. For details of the configuration of IP addresses etc. consult the supplied documentation.

CONNECTION TO A BACKUP MIMIC PANEL

CentrAlert can also be connected to a backup Mimic Panel which will operate in the event of a Management System failure ...



RS232 Connection to Backup Mimic Panel

A 9-pin male-to-female "twisted" cable with pins 2 & 3 crossed over is used for this connection.